Notice of Allowability	Application No.	Applicant(s)	
	09/391,399	YAMAGATA, HITOSHI	
	Examiner	Art Unit	
	Tiffany A Fetzner	2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *05/17/2004*.

2. ☒ The allowed claim(s) is/are *1-12*.

3. ☒ The drawings filed on *09 August 2001* are accepted by the Examiner.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☒ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *07/12/2004* .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

2. Authorization for this examiner's amendment was given in a telephone interview with Attorney **Larry Nixon Reg. No. 25,640** on July 8th 2004, and Attorney **Updeep Gill Reg. No. 37,334** on July 12th 2004, along with authorization to charge any necessary fees to applicant's deposit account.

3. The application has been amended as follows:

A) Replace the title with: **Spherical Magnetic Resonance Imaging Apparatus**

B) Replace the May 17th 2004 **claim 1** with the following **Examiner amended claim 1**:

Claim 1 --- A magnetic resonance imaging apparatus comprising:

a static magnetic field generator which generates a static field;

a gradient magnetic field generator which generates a gradient magnetic field that is superimposed on the static magnetic field;

a main enclosure having a spherical shape, formed so as to enable enclosing of a patient, the main enclosure including the static magnetic field and the gradient magnetic field;

a radio-frequency magnetic field pulse transmitting/receiving unit, which applies a radio-frequency pulse to a region of interest of a patient that is located within the static magnetic field, and which also receives a magnetic resonance signal that is generated from the patient;

a patient couch, which enables movement of the patient in the main enclosure;

a position information establishing apparatus which provides 3-dimensional position information of the region of interest of the patient; and

a patient couch controller which moves the patient couch, based on the provided position information, so that the region of interest is re-positioned in 3-dimensions substantially either at the center of the static magnetic field, or at the center of the gradient magnetic field. ---

C) Replace the May 17th 2004 **claim 6** with the following **Examiner amended claim 6**:

Claim 6 --- A method for performing magnetic resonance imaging

diagnosis in a magnetic resonance imaging apparatus having a main enclosure of spherical shape enabling enclosure of a patient, said method comprising:

placing the patient onto a patient couch that is disposed within a static magnetic field and a gradient magnetic field formed in the main enclosure;

moving the patient couch based on a signal from a position detector so that a region of interest of the patient approximately coincides with the center of the static magnetic field or the center of the gradient magnetic field;

applying a radio-frequency pulse to the region of interest of the patient, and receiving a magnetic resonance signal that is generated from the patient;

reconstructing a plurality of images of the patient, based on the magnetic resonance signal;

selecting an image that includes the region of interest from the plurality of images of the patient; and

moving the patient couch, based on the selected image, so that the region of interest of the patient substantially coincides in 3-dimensions with the center of the static magnetic field or the center of the gradient magnetic field. **---**

D) Replace the May 17th 2004 **claim 8** with the following **Examiner amended claim 8**:

Claim 8 **---** A method for performing magnetic resonance imaging diagnosis, said method comprising:

placing a patient onto a patient couch that is disposed within a main enclosure having a spherical shape, containing a static magnetic field and a gradient magnetic field;

designating a 3-dimensional position of a region of interest of the patient; and

moving the patient couch, so that the region of interest of the patient substantially coincides 3-dimensionally with the center of the static magnetic field or the center of the gradient magnetic field. **---**

E) Replace the May 17th 2004 **claim 11** with the following **Examiner amended claim 11**:

Claim 11 **---** A method for three-dimensionally positioning a patient region of interest substantially as an optimum MR imaging position for diagnostic imaging within an MRI system including a main enclosure having a spherical shape, said method comprising:

positioning a patient region of interest at a first position within an MRI field of view;

generating MR images of the patient in three dimensions while located at said first position using a first high speed positioning scan MRI data acquisition pulse sequence;

locating and designating the patient region of interest position within said images;

generating 3-dimensional position difference data between the designated position of the patient region of interest in the images and an optimum MR imaging position;

automatically re-positioning the patient region of interest in 3-dimensions from said first, now designated, position to an optimum MR imaging position using said position difference data; and

generating diagnostic MRI data, after the patient is re-positioned to said optimum MR imaging position, using a second diagnostic MRI data acquisition pulse sequence, different than said first sequence, to provide diagnostic images having improved precision and quality with reduced image distortion, non-uniformities and fat artifacts. ---

F) Cancel claim 13.

G) Cancel claim 14.

H) Cancel claim 15.

The following is an examiner's statement of **Reasons for Allowance:**

4. With respect to **examiner amended claims 1, 6, 8, 11; and dependent claims 2-5, 7, 9, 10,** and **12** These claims are allowable over the prior art of record because the **prior art of record** does not disclose or suggest an MRI apparatus / system / method including a main enclosure of the MRI system/apparatus which has a spherical shape, in combination with each of the remaining limitations of the respective claims.

5. The prior art of record teaches cylindrical / tube-like MRI systems which are either non-spherical, or are open MRI systems that fail to enclose the patient. Open systems teach away from applicant's examiner amended claims, because open systems by definition inherently and intrinsically fail to meet the required limitation of having a main patient enclosure. The Closed MRI systems which contain a main patient enclosure are not spherical enclosures because they fail to meet the definition of a sphere in three dimensions. At best the Closed MRI prior art of record teach/show MRI main enclosures/housings of circular-faced cylinders, or MRI main enclosures/housings which are circular in two-dimensions, with an extended, or reduced third dimension. These prior art MRI systems, apparatuses and methods, teach away from applicant's MRI system / apparatus / method which has a main enclosure of spherical shape

because a sphere by definition is a three-dimensional circle, therefore applicant's system is distinct from all closed cylindrical MRI apparatuses, methods, and systems.

6. It would not have been obvious to one of ordinary skill in the art at the time that the invention was made to construct a main MRI enclosure having spherical shape for imaging a patient, because a patient's anatomy (i.e. the patient is usually a human or animal) normally has at least one extended dimension in three dimensional space, and MRI systems are conventionally designed to encompass the patient with relatively the same dimensionality ratio, in order to ensure that diagnostically usable images are produced, and that the imaging coils are placed as close to the patient as possible. Applicant's spherical enclosure teaches away from these conventions. Applicant's invention permits a usable MRI diagnosis of a patient with a main enclosure having a spherical shape, in combination with each of the remaining limitations of the respective claims, and is therefore considered to be both novel and non-obvious by the examiner.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Prior Art made of Record

32. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

A) US patent 6,112,110 issued to **Wilk** August 29th 2000 and filed February 12th 1999. (Applicant's perfected priority eliminates this reference as prior art.)

B) US patent 6,198,957 B1 issued to **Green** March 6th 2001 filed December 19th 1997.

C) US patent 5,735,278 issued to **Hoult et al.,** April 7th 1998 and filed March 15th 1996.

D) US patent 924,987 issued to **Meaney et al.,** July 20th 1999 filed October 6th 1997.

E) US patent 4,829,252 issued to **Kaufman** May 9th 1989.

F) US patent 6,128,522 issued to **Acker et al.,** October 3rd 2000 and filed May 22nd 1998.

G) US patent 6,049,208 issued to **Takekoshi et al.,** April 11th 2000 filed Nov. 17th 1995.

H) US patent 6,094,590 issued to **Kan et al.,** July 25th 2000 filed September 18th 1997.

I) US patent 4,968,937 issued to **Akgun** November 6th 1990.

J) US patent 6,317,619 B1 issued to **Boernert et al.**, November 13th 2001 filed July 29th 1999. (Applicant's perfected priority eliminates this reference as prior art.)

K) US patent 6,298,259 B1 issued to **Kucharczyk et al.,** October 2nd 2001 filed October 16th 1998. (Applicant's perfected priority eliminates this reference as prior art.)

L) **Wilk** US patent 5,899, 857 issued May 4th 1999 filed January 7th 1997.

M) **Englund et al.,** US patent 5,197,474 issued March 30th 1993.

N) **McDougall** US patent 4,689,591 issued August 25th 1987.

O) **Smith et al.,** US patent 4,595,899 issued June 17th 1986.

P) **Frese et al.,** US patent 5,814,993 issued September 29th 1998, filed March 18th 1997.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

9. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.

TAF
July, 7th 2004

Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800